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ABSTRACT

The recent reauthorization of the Elementary and Secondary Education Act of 1965 (EASA), also known as the No Child Left Behind Act of 2001 (NCLB), provided broad changes encompassing many areas of public education in the United States. Accountability, expansion of school choice, increased focus on reading skills, and greater flexibility for state and local authorities are central pieces of the Act. Another area where emphasis and funding have increased significantly with the current reauthorization is educational technology. The most recent reauthorization has appropriated $1,000,000,000 for technology in education under the Enhancing Education Through Technology Act of 2001. Of the federal allocation, $15,000,000 has been committed to a long-term evaluation of technology and its effect on teaching and learning. Technology has come to play a central role in teaching and learning over the past 15 years, and during this period, educators and other researchers have evaluated many aspects of teaching and learning with technology. This paper addresses two questions: (1) What criticisms and obstacles may have impeded past research? (2) What are the implications of these obstacles for the study proposed under the NCLB Act of 2001? (AEF)

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The effectiveness of educational technology: Will the "Enhancing Education Through Technology Act of 2001" really expand our knowledge of teaching and learning with technology?

ED 479 620

Introduction

The recent reauthorization of the Elementary and Secondary Education Act of 1965 (EASA), also known as the No Child Left Behind Act of 2001 (NCLB) provided broad changes encompassing many areas of public education in the United States. Accountability, expansion of school choice, increased focus on reading skills, and greater flexibility for state and local authorities are central pieces of the Act. Another area where emphasis and funding have increased significantly with the current reauthorization is educational technology.

In 1994, the reauthorization of EASA known as "Improving America's Schools Act of 1994," (IASA) allocated $200,000,000 for Title III educational technology programs (Improving America's Schools Act of 1994, § 3114 (1995)). While this is a significant amount, Title III funding for fiscal year 1995 pales in comparison to funding for FY 2002. The most recent reauthorization has appropriated $1,000,000,000 for technology in education under the Enhancing Education Through Technology Act of 2001. Of this funding, $980,000,000 is earmarked for state and local initiatives while $20,000,000 has been set aside to fund federal programs. Furthermore, $15,000,000 of the federal allocation has been committed to a long-term evaluation of technology and its effect on teaching and learning (No Child Left Behind Act of 2001, Part D § 2401 (2002)). This longitudinal evaluation on the effectiveness of technology in learning promises to, "address a gap in knowledge that for years has frustrated both educators and policymakers" (Trotter, p.1, 2002). The Department of Education's Office of Educational Technology has yet to announce specific plans for the study so as of this writing, the author is not certain as to whether this project will consist of one comprehensive evaluation or a series of projects.

Technology has come to play a central role in teaching and learning over the past 15 years. During this period, educators and other researchers have evaluated many aspects of teaching and learning with technology. This paper will address two questions:

1. What criticisms and obstacles may have impeded past research?
2. What are the implications of these obstacles for the study proposed under the NCLB Act of 2001?

Each of these questions are important in light of the fact that considerable time and money have been set aside in an endeavor to answer the question decisively. Countless hours and dollars have already been devoted to this subject and one finds little difficulty in locating an "expert" on the topic. However, since the research has yet to provide satisfying results, it seems reasonable to consider why this is the case and what past research suggests about future research in learning and technology?

Literature Review

The astronomical growth of personal computing has brought space-age technology to the classroom. The computer has found its way into every corner of education. From college to kindergarten, educational technology has become the rule rather than the exception in a relatively short span of time. Research into the effectiveness of this technology has been conducted on all fronts from both federal and state government, universities and colleges, and even local educational agencies. Given the emphasis that educational technology research has received over the past decade, a large body of information exists. However, educational technology research conducted since 1990 has been wide-ranging and has attempted to cover a diverse spectrum. At

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times, the findings have been contradictory and subject to dispute. Kirstie Bellman succinctly argues that, "... the difficulty with educational technology is how to get past the hyperbole and develop the right technology with the right classroom and pedagogical practices that will ensure that it is supportive and not destructive for learners and for educators" (2001, Lines 2-5). Before spending more research dollars, we should consider what we have learned from past experience and what, if anything, it tells us about the future. The next section of this paper outlines two problems with past research: breadth of focus and methodology.

Research Criticisms

Research in educational technology encompasses a broad range of categories, sub-categories, and topics which all compete for scarce attention and even scarcer funding. It is this broad range of interests that make rigorous research in this area even more problematic. Because educational technology is at once, a learning issue, a teaching issue, an administrative issue, a social issue, and a political issue, a useful and effective body of research will necessitate the study of all the critical areas of educational technology and this challenge is nothing short of enormous.

One aspect of educational technology research that has received strong criticism has been methodology. Critics have complained about, among other things: a lack of scientific rigor, an over reliance on anecdotal evidence, and technological bias. Waetjen (in Wicklein, 1992) asserts that, "Die-hards claim that research isn't needed and instead offer up dozens of anecdotal accounts of students who have benefited from taking courses in technology education...Only research results will be convincing." (p. 4) While Waetjen was referring specifically to technology education; a minor part of the educational technology landscape, Reyna was addressing the broader issue of educational technology when she criticized a reliance on tradition, superstition, and a reliance on unfounded beliefs (Reyna, 2002).

Feuer and Towne (2002) describe three more problems with previous educational technology research. Researcher bias is a problem because scholars who are closely involved in the environment and frequently even the educational lives of the other participants have conducted a great deal of research (2002). Proximity between researcher and participant has been generally unavoidable and not always undesirable, but it is an area that must be addressed. Patton (1990) suggests that, "getting close to a program through firsthand experience permits the evaluator to access personal knowledge and direct experience as resources to aid in understanding and interpreting the program being evaluated" (pg. 205). However, if the researcher fails to consider her own experiences and background, her participation may influence the findings. This participation or influence would have serious consequences for the validity of a quantitative study and the trustworthiness of a qualitative study.

The second problem described by Feuer and Towne is one of description versus prediction. Educational technology research, and indeed educational research in general has produced research products which are descriptive in nature. The results do not predict future events, behaviors, or changes but merely describe what has occurred in a given situation in the past (2002). Just because a research project is carefully designed, conducted, and reported doesn't make it relevant or useful to a practitioner outside of the research environment. Good educational technology research must have some utilitarian value to practitioners in "the field," particularly if it is supposed to describe and predict how technology facilitates learning in the classroom.

The third criticism involves the diverse and decentralized structure of public schools in the United States. Local control creates a situation where a number of independent local

programs may be referred to by the same title or other descriptor but have no relationship whatsoever with other programs of the same name (Feuer & Towne, 2002). This creates a situation where information is either, not generalizable to other populations, or it is accepted as relevant because of similar titles and terminology when, in fact, it is completely unrelated to the current program or programs of interest. The democratic and geographic nature of our federal, state, and local institutions makes it extremely difficult to generalize many findings in educational research. What works for a small rural single school district in Arkansas is not likely to have much relevance for an urban district that may have 100 different schools and vice versa. I think that this is probably the most significant difficulty in conducting research related to educational practices in this country. Our continued preference for local control makes comparison between schools extremely problematic.

Methods

To illustrate the vast body of educational technology research conducted in the past few years, the author of this paper conducted a survey of common educational technology research areas. Using target areas described in the "Enhancing Education Through Technology Act of 2001," the researcher conducted a search of the Educational Resources Information Center (ERIC) database (http://www.askeric.org/) (No Child Left Behind Act, 2001). While the ERIC database does not provide a complete list of all research conducted in the past 12 years, it does offer a reasonably extensive cross-section of data. The current search was conducted by combining the terms 'educational' and 'technology' with each of the following terms or phrases: teacher training, technology integration, assessment and evaluation, and finally, standards and frameworks. The keyword search method utilized the Boolean operator 'AND' and was restricted to the years 1990 through 2002.

Results

The search results in the table below illustrate the breadth of research in the field of educational technology during the 1990s. The search terms, assessment and evaluation, yielded the smallest number of documents for the 12-year time period. However, the 2,329 documents produced by this search still represented an average of 3.73 new articles, reports, and presentations every week from 1990 through the end of 2001.

Search Terms	Results
Educational AND technology ONLY	30,342 documents
Educational AND technology AND teacher training	2,539 documents
Educational AND technology AND integration	5,308 documents
Educational AND technology AND assessment AND evaluation	2,329 documents
Educational AND technology AND standards	2,699 documents
Search conducted: March 11, 2002. http://www.askeric.org	

The original or primary search terms, 'educational' and 'technology' provided the greatest number of results in the ERIC database search. It is assumed that this search yielded all the documents represented by the secondary search terms as well as other educational technology terminology not searched for this report. The ERIC search yielded a total of 30,342 individual documents for the same period from 1990 through 2001. It would take a very diligent researcher to keep up with the approximately 48.65 new educational technology documents that were created every week. The volume alone is enough to perplex and discourage even the most committed educational technology researcher. Given the vast array of research areas which fall under the collective heading of educational technology, it is not difficult to see why research may

appear to be insufficient and lacking in meaning and relevance. Unfortunately this is a problem for which there appears to be no clear or easy solution. By nature and definition, the field of educational technology does and will continue to encompass diverse areas of interest as demonstrated by the ERIC search. The task will continue to seem overwhelming and the best opportunity to improve research quality is through more focused, scientifically based research.

Discussion

Given the vast body of research that has occurred since 1990, what direction should future researchers take when examining the effectiveness of educational technology? Melmed (1995) provides a typical example of a broad-based initiative to study the effectiveness of educational technology. In 1995, the U.S. Department of Education requested assistance from the Rand Corporation in responding to the GOALS 2000:Educate America Act of 1994. Melmed served as chair of a 2-day workshop: Workshop on Technology-Supported Student Learning: Outcomes, Effectiveness and Cost. The workshop goals were wide-ranging and diverse. Many of the research questions were similar to the same ones framed in the current research climate.

Unfortunately this example is also an indicator of why little has changed. A two-day seminar that featured 14 presentations was supposed to answer questions and improve education in this country. Again, the 14 presentations were, in general, descriptions of programs and projects deemed successful by their presenters. While many of these may have been valuable in the original research context, there is little reason to suspect that much impact was felt by those not involved in the initial project.

Feuer & Towne (2002) have suggested six principles to guide future research in education that are worthy of mention.

1. Pose Significant Questions That Can Be Investigated Empirically
2. Link Research to Theory
3. Use Methods That Permit Direct Investigation of Question
4. Provide Coherent Chain of Rigorous Reasoning
5. Replicate and Generalize
6. Transparency and Scholarly Debate

These ideas are nothing new to researchers in other discipline areas and are not even novel to educational researchers. However, in educational research most of these principles have not been used systematically or coherently. Given the lofty goals of the NCLB Act of 2001, strict adherence to these basic principles of research will be crucial to determining what educational technology practices and programs are effective and what programs should be abandoned to the scrap heap of experience.

Valid and relevant research requires a thoughtful and systematic approach. The pervasive nature of technology in teaching and learning necessitates research for understanding in a broad area including: teacher training, technology integration, technical literacy for students, and access. Despite the fact that some of these areas are not technically interrelated, none can be ignored. The critical need will be to prioritize focus areas to maximize opportunity for real and useful research-based results.

In order to realized the lofty goals set forth in the "No Child Left Behind" Act of 2001, educators, administrators, and politicians will need to reach some consensus regarding priorities for study. However, this will be a tremendous challenge because, regardless of the technological advancements available to students and educators, the fundamental question remains one at the heart of all educational reform: What is the purpose of public education in this country and what are appropriate goals for realizing that purpose? Any research and reform efforts that fail to

honestly address this question are likely to face the same problems and shortcomings of previous research.

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